

Claims

1. A system offering an Application Programming Interface  
5 (101b) for multi-stream multimedia applications (130) running  
on at least two registered end peers participating in a mo-  
bile telecommunication session and/or middleware (130) being  
connected to a mobile network, said system (128) providing  
guaranteed end-to-end quality and resource capabilities using  
10 the concept of concatenated E2ENP phases and being adapted to  
provide

- a pre-negotiation of a multiplicity of alternative capa-  
bilities and QoS Contracts,
- management of leased pre-negotiated information,
- 15 - session establishment between said end peers with negotia-  
tion of a multiplicity of alternative capabilities and/or  
QoS Contracts, and
- a dynamic re-negotiation of the end-to-end quality and ca-  
pabilities,

20 wherein the information to be negotiated is expressed in an  
interchangeable format so as to allow said multi-stream mul-  
timedia applications (130) to agree on a specific reference  
model of the negotiated information, which can then be used  
for dynamically configuring Finite State Machines (106) to  
25 orchestrate local, peer, and network resources according to  
the preferences and profiles of the respective user.

2. A system according to claim 1,  
characterized in that  
30 said system (128) is internally decomposed into a set of Fi-  
nite State Machines (106) coordinating the internal processes  
and Application Programming Interfaces (101a-e).

3. A system according to claim 2,  
characterized in that  
said multi-stream multimedia applications (130) and/or said  
5 middleware (130) use said Finite State Machines (106) for a  
dynamic configuration.

4. A system according to anyone of the preceding claims,  
characterized in that  
10 it is designed to support multiple concurrent users.

5. A system for establishing a session between two entities  
in a telecommunications network, said unit (128) comprising  
the following Application Programming Interfaces (APIs):

- 15 - a Management API (101a) representing an interface (IF1) be-  
tween the unit (128) and an entity (102) managing it,
- an API (101b) representing an interface (IF2) between the  
unit (128), middleware (130) and/or an application (130)  
using services offered by the unit (128),
- 20 - a generic session-layer protocol API (101c) representing an  
interface (IF3) between the unit (128) and a User Agent  
(110) of a session-layer protocol.

6. A system according to anyone of the preceding claims,  
25 characterized by  
a two-stage E2ENP Cache (104) for managing negotiation object  
identifiers in order to decouple the identification scheme of  
a specific application (130) and/or middleware (130) from the  
one specified for the E2ENP by non-persistently storing and  
30 retrieving  

- E2ENP session identifiers referring to the respective mo-  
bile telecommunication session,

- the E2ENP session identifiers referring to the respective Service Provider (110) handled by the Finite State Machine (106) of the unit (128), and
- the E2ENP session identifiers referring to the respective  
5 Service User (130) handled by any application (130) and/or middleware (130) using the services offered by said unit (128).

7. A system according to anyone of the preceding claims,  
10 characterized in that the unit (128) is adapted to

- pre-cache information during the execution of a given E2ENP pre-negotiation or negotiation procedure, wherein the pre-cached data remains cached for future reference during a  
15 later E2ENP session once the given procedure has been successfully completed, and
- to cache information which can be applied as a reference to data, which has already been (pre-)negotiated among the end peers, during a new E2ENP pre-negotiation or negotiation  
20 procedure.

8. A system according to anyone of the preceding claims, characterized by  
E2ENP session-layer protocol APIs (101a-e) being independent  
25 of the actually used session-layer protocol and the session description protocol implementations.

9. A system according to anyone of the preceding claims, characterized by  
30 a Factory API (101e) representing an interface (IF5) between the unit (128) and a Factory instance (114) used for encoding an E2ENP session description.

10. A system according to anyone of the preceding claims,

characterized by  
a Parser API (101d) representing an interface (IF4) between  
the unit (128) and a Parser instance (112) needed for decod-  
ing an E2ENP session description.

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11. A system according to anyone of the claims 9 and 10,  
characterized in that  
the Parser instance (112) and the Factory instance (114) can  
be configured independently by using the same protocol.

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12. A system according to anyone of the preceding claims,  
based on a novel usage of the Session Initiation Protocol  
(SIP) in conjunction with extensions of the Session Descrip-  
tion Protocol (SDP) or Session Description Protocol - Next  
15 Generation (SDPng), respectively.

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13. A system according to claim 12,  
characterized in that  
the session-layer protocol and the Session Description Proto-  
20 col (SDP) or Session Description Protocol - Next Generation  
(SDPng), respectively, are independently configurable.

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14. A negotiation method providing guaranteed end-to-end  
quality and resource capabilities for multi-stream multimedia  
25 applications (130) running on at least two registered end  
peers participating in a mobile telecommunication session  
and/or middleware (130) being connected to a mobile network  
to dynamically adapt to changes in transmission quality,  
which is based on extensions of the End-to-End Negotiation  
30 Protocol (E2ENP), said method providing

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- a pre-negotiation of a multiplicity of alternative capa-  
bilities and QoS Contracts,
- management of leased pre-negotiated information,
- session establishment between said end peers with negotia-  
35 tion of a multiplicity of alternative capabilities and/or

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QoS Contracts and coordination of terminal and network resource reservations, and

- a fast, dynamic re-negotiation of the end-to-end quality and capabilities

5 using the concept of concatenated E2ENP phases, characterized by the step of expressing the information to be negotiated in an interchangeable format so as to allow said multi-stream multimedia applications (130) to agree on a specific reference model of  
10 the negotiated information, which can then be used for dynamically configuring Finite State Machines (106) to orchestrate local, peer, and network resources according to the preferences and profiles of the respective user.

15 15. A negotiation method according to claim 14, characterized in that the resource reservation coordination process is based on a multi-phase call-setup mechanism that makes network QoS and security establishment a precondition to sessions initiated  
20 by the session-layer protocol and described by a session description protocol implementation, wherein network resource reservation mechanisms are deployed before the session is started, wherein Indication (Ind) and Confirmation (Cfm) primitives,  
25 which are invoked by the unit (218) to the registered client side of the middleware (130) in order to respectively indicate the arrival of a particular message exchange or confirm the conclusion of a given message exchange, are an integral part of the E2ENP and mapped to a E2ENP „qosdef“ section  
30 (1300), which either specifies capabilities of a peer or defines validated QoS contracts that have been validated by entities using the unit (128), and its corresponding negotiation process.

35 16. A negotiation method according to anyone of the claims 14

and 15,  
characterized by  
a mandatory synchronization of the reservation processes between different peers according to an „Economy Principle“.

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17. A negotiation method according to anyone of the claims 14 to 16,

characterized in that

in case no network resource reservation is conducted by the  
10 end peer at the Offerer side, the unit (128) of another end  
peer acting as an Answerer determines this case by examining  
the preconditions made by the Offerer and correspondingly enables the Answerer to transparently deal with resource reservation coordination.

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18. A negotiation method according to anyone of the claims 14 to 17,

characterized by the step of

allowing both end-to-end and segmented reservations, wherein  
20 network resource reservation is done locally on beforehand  
with no cost and/or major impact on session establishment.

19. A negotiation method according to anyone of the claims 14 to 18,

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characterized in that

in case a multi-stream multimedia application (130) or middleware (130) wishes to execute a „pre-reservation“ of network resources, the E2ENP signaling gives the right timing to said application (130) or middleware (130), respectively,  
30 thereby informing it when the resource reservations at all sides have been accomplished.

20. A negotiation method according to anyone of the claims 14 to 19,

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characterized by

a new E2ENP syntax which allows that E2ENP addresses (600) identifying different E2ENP users, which are passed on by the applied pre-negotiation and negotiation primitives and mapped to the specific syntax used by the underlying session-layer  
5 protocol that is used for piggybacking E2ENP information, are independent of said session-layer protocol and/or the respective transport protocol used underneath by the unit (128).

21. A contention resolution method used for a negotiation  
10 method according to anyone of the claims 14 to 20, which is applied in case of two peers initiating E2ENP phases at the same time,

wherein the E2ENP UA (128) does not only include the session identifier sent by an Offerer but also a hash thereof as a  
15 substitute for said session identifier in any subsequent session-layer protocol message which takes the IP address of the computing unit where the E2ENP UA (128) is active into account and a time stamp, which is applied whenever a negotiation or pre-negotiation phase is initiated.

20 22. A contention resolution method according to claim 21, characterized in that

in case two peers are not already involved in multimedia sessions, each peer compares the hash it has generated with the  
25 one received from the peer, and the peer with the biggest value is automatically chosen as Offerer and thus proceeds with the pre-negotiation or negotiation phase as such, whereas the other peer automatically moves to the Answerer mode.

30 23. A contention resolution method according to claim 21, characterized in that

in case two peers are already involved in multimedia sessions, the peer whose request has been rejected applies an  
35 unplanned re-negotiation procedure after the peer whose re-

quest has been accepted has completed its negotiation procedure.

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24. A telecommunications network,  
characterized in that  
said telecommunications network comprises an system (128) according to anyone of claims 1 to 13.

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25. A computer software program product,  
characterized in that  
said computer software program product implements a system  
(128) according to anyone of claims 1 to 13 when running on a  
15 mobile terminal in a wireless network environment.